

## CLAIMS

We claim:

- 1 1. A computer implemented method comprising:  
2 representing a label switched path (LSP) with a data structure, the data structure  
3 indicating a virtual ingress and an identifier to distinguish the LSP from other  
4 LSPs represented with the same virtual ingress.
- 1 2. The computer implemented method of claim 1 wherein the data structure does not  
2 indicate network layer information.
- 1 3. The computer implemented method of claim 1 wherein the virtual ingress includes a  
2 virtual port and a virtual slot.
- 1 4. The computer implemented method of claim 1 further comprising distributing the data  
2 structure one of a set of one or more label forwarding information bases (LFIBs) within a  
3 data plane.
- 1 5. The computer implemented method of claim 1 further comprising:  
2 maintaining a second data structure that indicates the data structure, a physical egress  
3 for the LSP, and encapsulation information.
- 1 6. The computer implemented method of claim 5 wherein the egress includes a slot and  
2 a port.
- 1 7. The computer implemented method of claim 5 wherein the second data structure  
2 further includes an LSP identifier.
- 1 8. The computer implemented method of claim 5 further comprising:

2 distributing the data structure to certain ones of a set of one or more label forwarding  
3 information bases (LFIBs) within a data plane; and  
4 distributing the encapsulation information to one of a set of data structures that  
5 correspond to the egress

1 9. A method for a network element comprising:  
2 maintaining for network layer switched routes interface structures each storing a set of  
3 network layer information;  
4 distributing each of the interface structures to a set of one or more of a plurality of  
5 routing protocol modules;  
6 maintaining a routing information base responsive to the plurality of routing protocol  
7 modules;  
8 distributing forwarding information bases to each of a plurality of line cards;  
9 maintaining for each label switched path (LSP) a forwarding data structure that is  
10 separate from the interface structures and that does not include the set of  
11 network layer information; and  
12 distributing different ones of the forwarding data structures to different ones of the  
13 plurality of line cards apart from distribution to the plurality of routing  
14 protocol modules and the routing information base.

1 10. The method of claim 9 wherein the forwarding data structure includes a first field to  
2 indicate a port, a second field to indicate a slot, and a third field to indicate a flow.

1 11. The method of claim 10 wherein the port is a virtual port and the slot is a virtual slot.

1 12. The method of claim 9 further comprising maintaining for each forwarding structure,  
2 a data structure that indicates an egress slot and encapsulation information.

1 13. The method of claim 12 wherein the data structure further indicates an egress port.

1 14. The method of claim 12 further comprising distributing the egress slot and  
2 encapsulation information from different ones of the data structures to different ones of the  
3 line cards apart from distribution to the plurality of routing protocol modules and the routing  
4 information base.

1 15. A method for a network element comprising:  
2 establishing a first and second label switched paths respectively involving packets  
3 traveling through a first and second line cards; and  
4 storing in said first line card information regarding said first label switched path but  
5 not said second label switched path; and  
6 storing in said second line card information regarding said second label switched path  
7 but not said first label switched path.

1 16. The method of claim 15 wherein said information includes a port identifier that  
2 indicates a virtual port, a slot identifier that indicates a virtual slot, and a flow identifier.

1 17. The method of claim 16 wherein the port identifier and the slot identifier are the same  
2 for the first and second label switched paths (LSPs) and the flow identifier for the first LSP is  
3 different than the flow identifier for the second LSP.

1 18. A network element comprising:  
2 a plurality of line cards;  
3 a control card having stored therein,  
4 a plurality of interface structures having stored therein network layer  
5 information;  
6 a plurality of routing protocol modules coupled to one or more of the plurality  
7 of interface structures;

8 a routing information base coupled to said plurality of routing protocol  
9 modules;  
10 a plurality of forwarding data structures each having stored therein  
11 information to determine forwarding of packets from an ingress one of  
12 said plurality of line cards to an egress one of said plurality of line  
13 cards, wherein a set of one or more of said plurality of forwarding data  
14 structures include data indicating that they represent a label switched  
15 path;  
16 a first of said plurality of line cards having stored therein,  
17 a label forwarding information base generated from at least certain of said  
18 plurality of forwarding data structures indicating that they represent  
19 label switched paths; and  
20 a network layer forwarding information base generated from said routing  
21 information base.

19. The network element of claim 18 wherein said information includes a slot identifier, a  
2 port identifier, and a flow identifier.

1 20. The network element of claim 19 wherein the slot identifier of each forwarding  
2 structure indicates the same virtual slot and the port identifier for each forwarding structure  
3 indicates the same virtual port.

1 21. The network element of claim 18 wherein the control card further has stored therein a  
2 plurality of data structures, different ones of the plurality of data structures indicating  
3 different ones of said plurality of forwarding structures, egress slots, and encapsulation  
4 information.

1 22. A network element comprising:  
2 a set of one or more control cards to host a label manager;

3 a machine-readable medium coupled with the set of control cards, the machine-  
4 readable medium having a data structure for a label switched path (LSP), the  
5 data structure having a first field for a first value to indicate a virtual slot, a  
6 virtual port, and a first identifier, a second field for a second value to indicate  
7 an egress slot and encapsulation information, to distribute the first value and  
8 the second value to one of a set of label forwarding information bases (LFIBs),  
9 and to distribute the second value to one of a set of one or more line cards;  
10 the set of one or more line cards coupled with the set of control cards, the set of line  
11 cards to receive and to forward traffic.

23. The network element of claim 22 wherein the encapsulation information includes an  
egress label.

24. The network element of claim 22 further comprising the set of instructions causing  
the label manager to associate an egress port with the second value.

25. A system comprising:

2 a first network element having a set of instructions causing the first network element  
3 to represent a label switched path (LSP) with a forwarding data structure that  
4 includes a slot identifier indicating virtual slot , a port identifier indicating a  
5 virtual port, and a flow identifier, to maintain a data structure that indicates the  
6 forwarding structure and forwarding information for the LSP, and to transmit a  
7 set of traffic along the LSP with the forwarding information; and  
8 a second network element coupled with the first network element, the second network  
9 element to receive the set of traffic.

26. The system of claim 25 wherein the forwarding information includes an egress slot  
and encapsulation information.

1 27. The system of claim 25 wherein the forwarding information includes an egress port.

1 28. A machine-readable medium having a data structure comprising:

2 a first field to indicate a virtual ingress;

3 a second field to indicate a set of one or more physical egress resources, a set of  
4 encapsulation information; and

5 a third field to indicate an identifier for a label switched path (LSP).

1 29. The machine-readable medium of claim 28 wherein the set of virtual resources  
2 include a virtual slot and a virtual port.

1 30. The machine-readable medium of claim 28 wherein the physical egress resources  
2 include a slot.

1 31. The machine-readable medium of claim 30 wherein the physical egress resources  
2 include an egress port.

1 32. The machine-readable medium of claim 28 further comprising a fourth field to  
2 indicate an egress port.

1 33. The machine-readable medium of claim 28 wherein the encapsulation information  
2 includes an egress label.

1 34. A machine-readable medium having a data structure comprising:

2 a first field to indicate label switched path (LSP) with a virtual slot, a virtual port, and  
3 an identifier;

4 a second field to indicate a value that is associated with encapsulation information and  
5 a physical slot.

1 35. The machine-readable medium of claim 34 wherein the second value references a data  
2 structure that indicates the encapsulation information and the physical slot.

1 36. The machine-readable medium of claim 34 wherein the encapsulation information  
2 includes an egress label.

1 37. The machine-readable medium of claim 34 further comprising a third field to indicate  
2 an LSP identifier.

1 38. The machine-readable medium of claim 34 further comprising a third field to indicate  
2 an egress port.

1 39. A machine-readable medium having a label forwarding information base (LFIB)  
2 comprising:

a set of one or more entries, each of the set of entries having

a first field to indicate an index value corresponding to an ingress label for a  
label switched path; and

a second field to indicate a virtual slot, a virtual port and an identifier.

1 40. The machine-readable medium of claim 40 wherein each of the set of entries has a  
2 third field to indicate a physical slot.

1 41. The machine-readable medium of claim of claim 40 wherein the third field further  
2 indicates an egress port.

1 42. The machine-readable medium of claim 39 wherein the second field further indicates  
2 a physical slot.

1 43. The machine-readable medium of claim 39 wherein the second field further indicates  
2 an egress port.

1 44. A machine-readable medium that provides instructions, which when executed by a set  
2 of one or more processors, cause said set of processors to perform operations comprising:  
3 representing a label switched path (LSP) with a data structure that indicates a virtual  
4 slot, a virtual port, and a value that identifies the LSP for the indicated virtual  
5 slot and virtual port, path, the path indicating a first slot identifier that  
6 identifies a virtual slot, and a path identifier.

1 45. The machine-readable medium of claim 44 further comprising distributing the data  
2 structure one of a set of one or more label forwarding information bases (LFIBs) within a  
3 data plane.

1 46. The machine-readable medium of claim 44 further comprising:  
2 maintaining a second data structure that indicates the data structure, an egress for the  
3 LSP, and encapsulation information.

1 47. The machine-readable medium of claim 45 wherein the egress includes a slot and a  
2 port.

1 48. The machine-readable medium of claim 45 wherein the second data structure further  
2 includes an LSP identifier.

1 49. The machine-readable medium of claim 46 further comprising:  
2 distributing the data structure to certain ones of a set of one or more label forwarding  
3 information bases (LFIBs) within a data plane; and  
4 distributing the encapsulation information to one of a set of data structures that  
5 correspond to the egress.

1 50. A machine-readable medium that provides instructions, which when executed by a set  
2 of one or more processors, cause said set of processors to perform operations comprising:  
3 maintaining a first data structure that represents a label switched path (LSP), the first  
4 data structure indicating a virtual ingress into a network element and an  
5 identifier to distinguish LSPs represented with the virtual ingress; and  
6 maintaining a second data structure that indicates the first data structure, an egress  
7 from the network element for LSP, and encapsulation information.

51. The machine-readable medium of claim 50 wherein the virtual ingress includes a  
virtual port and a virtual slot.

52. The machine-readable medium of claim 50 wherein the egress includes a slot and  
port.

53. The machine-readable medium of claim 50 wherein the encapsulation information  
includes an egress label.

54. The machine-readable medium of claim 50 wherein the second data structure further  
includes a port and the egress includes a slot.

55. The machine-readable medium of claim 3 further comprising:  
distributing the first data structure to certain ones of a set of one or more label  
forwarding information bases (LFIBs) within a data plane; and  
distributing the encapsulation information to one of a set of data structures that  
correspond to the egress.

56. A machine-readable medium that provides instructions, which when executed by a set  
of one or more processors, cause said set of processors to perform operations comprising:

maintaining in a control plane a first data structure that represents a label switched path (LSP), the first data structure indicating a virtual port, a virtual slot, and an identifier to distinguish LSPs of the virtual port and the virtual slot; maintaining in the control plane a second data structure indicating the first data structure, a slot, encapsulation information, and an index for the slot and the encapsulation information; distributing the first data structure, the index, and the egress to certain of a set of one or more label forwarding information bases (LFIBS) in a data plane; distributing the index and the encapsulation information to certain of a set of data structures within the data plane.

57. The machine-readable medium of claim 56 wherein the second data structure further indicates a port.

58. The machine-readable medium of claim 56 wherein the encapsulation information includes an egress label.